SAMSUNG ELECTRONICS INC 67E D ■ 7964142 0017311 950 ■SMGK

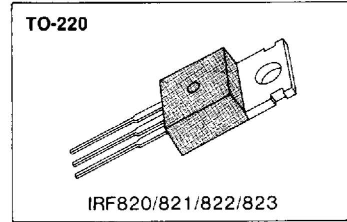
IRF820/821/822/823

N-CHANNEL POWER MOSFETS

FEATURES

- Lower $R_{DS(ON)}$
- Improved inductive ruggedness
- Fast switching times
- Rugged polysilicon gate cell structure
- Lower input capacitance
- Extended safe operating area
- Improved high temperature reliability

TO-220



IRF820/821/822/823

PRODUCT SUMMARY

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRF820	500V	3.0Ω	2.5A
IRF821	450V	3.0Ω	2.5A
IRF822	500V	4.0Ω	2.2A
IRF823	450V	4.0Ω	2.2A

MAXIMUM RATINGS

Characteristics	Symbol	IRF820 IRF420	IRF821 IRF421	IRF822 IRF422	IRF823 IRF423	Unit
Drain-Source Voltage (1)	V_{DSS}	500	450	500	450	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ)(1)	V_{DGR}	500	450	500	450	Vdc
Gate-Source Voltage	V_{GS}	±20				Vdc
Continuous Drain Current T_C=25°C	I_D	2.5	2.5	2.2	2.2	Adc
Continuous Drain Current T_C=100°C	I_D	1.6	1.6	1.4	1.4	Adc
Drain Current—Pulsed (3)	I_{DM}	8.0	8.0	7.0	7.0	Adc
Gate Current—Pulsed	I_{GM}	±1.5				Adc
Single Pulsed Avalanche Energy(4)	E_{AS}	210				mJ
Avalanche Current	I_{AS}	2.5				A
Total Power Dissipation @ T_C=25°C Derate above 25°C	P_D	50 0.4				Watts W/°C
Operating and Storage Junction to Case	T_J, Tstg	−55 to 150				°C
Maximum Lead Temp. for Soldering Purposes, 1/8″ from case for 5 seconds	T_L	300				°C

Notes: (1) T_J=25°C to 150°C
(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse with limited by max. junction temperature
(4) L=60 mH, V_{dd}=50V, R_G=25Ω, Starting T_j=25°C

SAMSUNG ELECTRONICS INC 67E D ■ 7964142 0017312 897 ■SMGK

ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise specified)

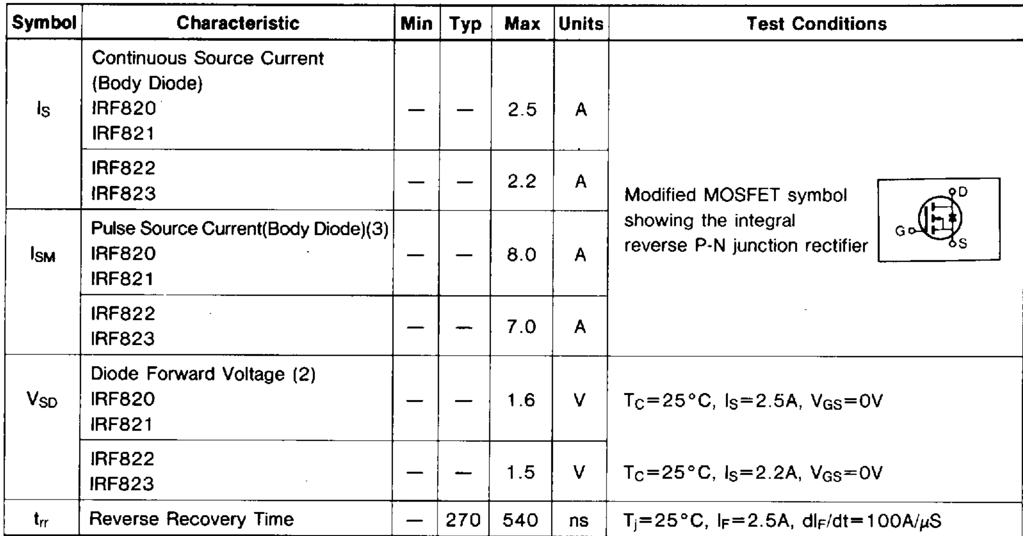
Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage IRF820 IRF822	500	—	—	V	V_{GS}=0V I_D=250μA
	IRF821 IRF823	450	—	—	V	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS}=V_{GS}, I_D=250μA
I_{GSS}	Gate-Source Leakage Forward	—	—	100	nA	V_{GS}=20V
I_{GSS}	Gate-Source Leakage Reverse	—	—	−100	nA	V_{GS}=−20V
I_{DSS}	Zero Gate Voltage Drain Current	—	—	250	μA	V_{DS}=Max. Rating, V_{GS}=0V
		—	—	1000	μA	V_{DS}=Max. Rating×0.8, V_{GS}=0V, T_C=125°C
$I_{D(on)}$	On-State Drain-Source Current (2) IRF820 IRF821	2.5	—	—	A	V_{DS}≥10V, V_{GS}=10V
	IRF822 IRF823	2.0	—	—	A	
$R_{DS(on)}$	Static Drain-Source On-State Resistance (2) IRF820 IRF821	—	2.5	3.0	Ω	V_{GS}=10V, I_D=1.4A
	IRF822 IRF823	—	3.0	4.0	Ω	
g_{fs}	Forward Transconductance (2)	1.5	2.3	—	℧	V_{DS}≥10V, I_D=1.4A
C_{iss}	Input Capacitance	—	390	—	pF	V_{GS}=0V, V_{DS}=25V, f=1.0MHz
C_{oss}	Output Capacitance	—	52	—	pF	
C_{rss}	Reverse Transfer Capacitance	—	22	—	pF	
$t_{d(on)}$	Turn-On Delay Time	—	10	15	ns	V_{DD}=0.5BV_{DSS}, I_D=2.5A, Z_O=18Ω (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	—	12	18	ns	
$t_{d(off)}$	Turn-Off Delay Time	—	28	42	ns	
t_f	Fall Time	—	12	18	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	—	13	19	nC	V_{GS}=10V, I_D=2.5A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature.)
Q_{gs}	Gate-Source Charge	—	2.2	3.3	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	—	6.8	10	nC	

THERMAL RESISTANCE

Symbol	Characteristic		IRF820-3	Unit	
R_{thJC}	Junction-to-Case	MAX	2.5	K/W	
R_{thCS}	Case-to-Sink	TYP	0.5	K/W	Mounting surface flat, smooth, and greased
R_{thJA}	Junction-to-Ambient	MAX	80	K/W	Free Air Operation

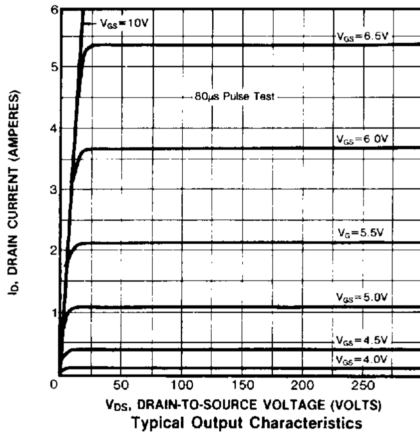
Notes: (1) T_J=25°C to 150°C
(2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse width limited by max. junction temperature

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

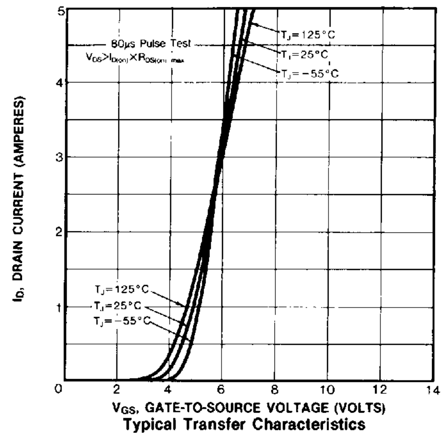


Symbol	Characteristic	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode) IRF820 IRF821	—	—	2.5	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier
	IRF822 IRF823	—	—	2.2	A	
I_{SM}	Pulse Source Current(Body Diode)(3) IRF820 IRF821	—	—	8.0	A	
	IRF822 IRF823	—	—	7.0	A	
V_{SD}	Diode Forward Voltage (2) IRF820 IRF821	—	—	1.6	V	$T_C=25°C$, $I_S=2.5A$, $V_{GS}=0V$
	IRF822 IRF823	—	—	1.5	V	$T_C=25°C$, $I_S=2.2A$, $V_{GS}=0V$
t_{rr}	Reverse Recovery Time	—	270	540	ns	$T_j=25°C$, $I_F=2.5A$, $dI_F/dt=100A/\mu S$

Notes: (1) $T_J=25°C$ to 150°C (2) Pulse test: Pulse width≤300μs, Duty Cycle≤2%
(3) Repetitive rating: Pulse with limited by max. junction temperature



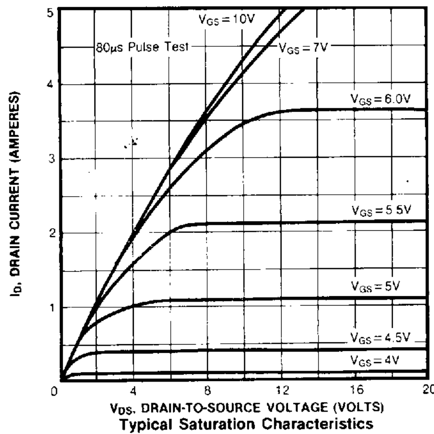
Typical Output Characteristics



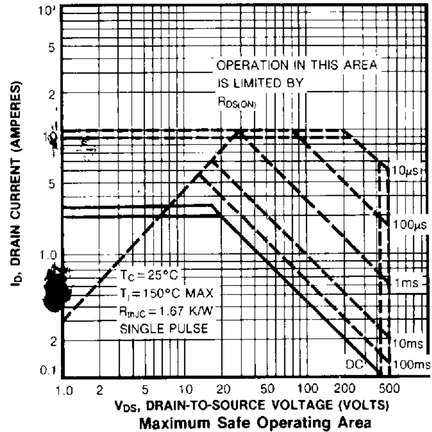
Typical Transfer Characteristics

SAMSUNG ELECTRONICS INC 67E D 7964142 0017313 723 SMGK

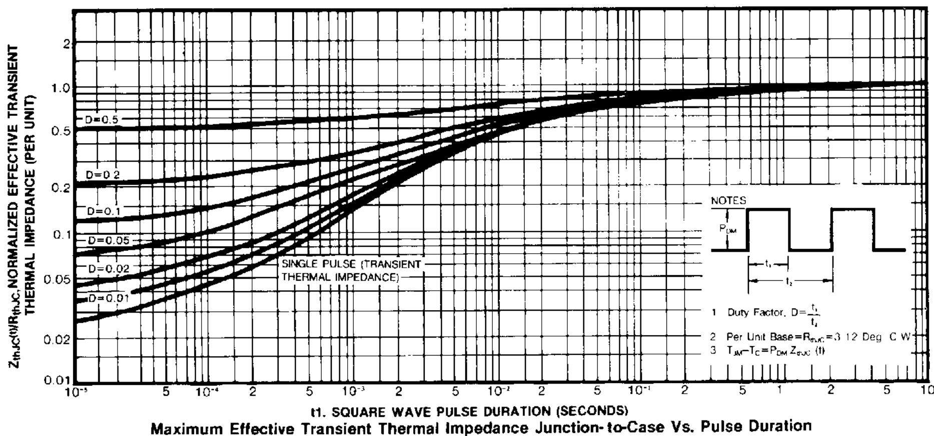
SAMSUNG ELECTRONICS INC 67E D 7964142 0017314 66T SMGK



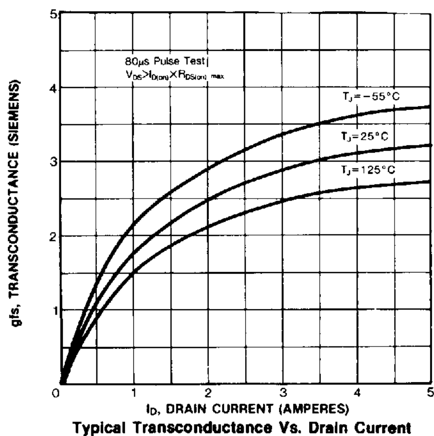
Typical Saturation Characteristics



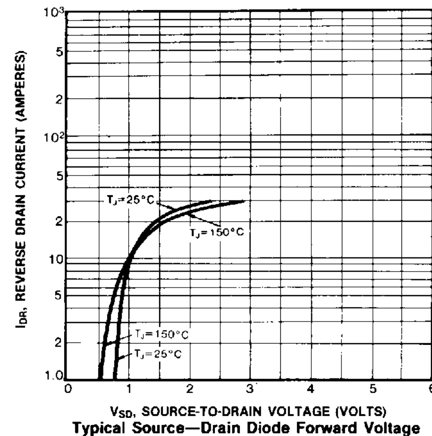
Maximum Safe Operating Area



Maximum Effective Transient Thermal Impedance Junction-to-Case Vs. Pulse Duration

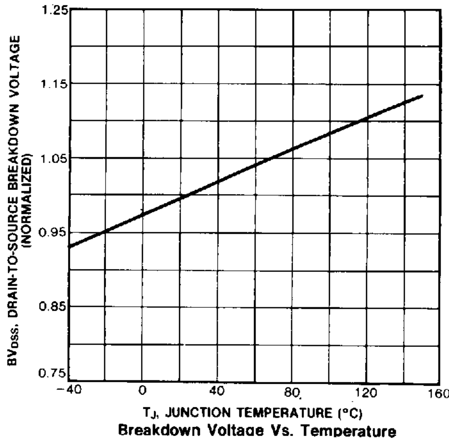


Typical Transconductance Vs. Drain Current

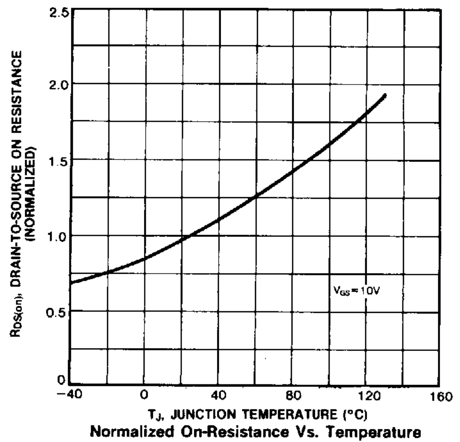


Typical Source—Drain Diode Forward Voltage

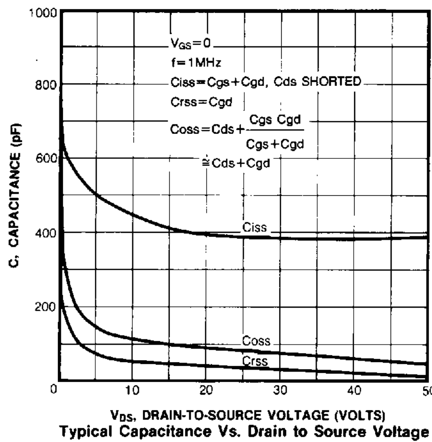
SAMSUNG ELECTRONICS INC 67E D ■ 7964142 0017315 5T6 ■SMGK



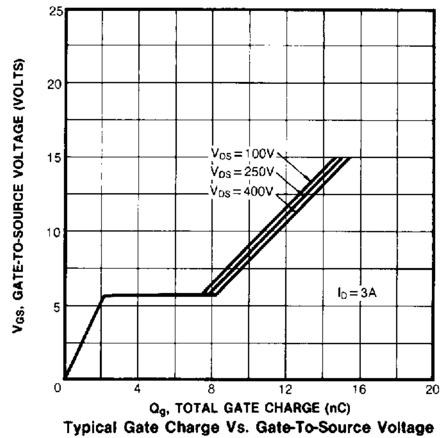
Breakdown Voltage Vs. Temperature



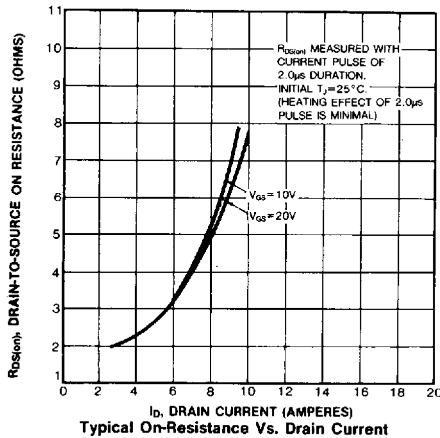
Normalized On-Resistance Vs. Temperature



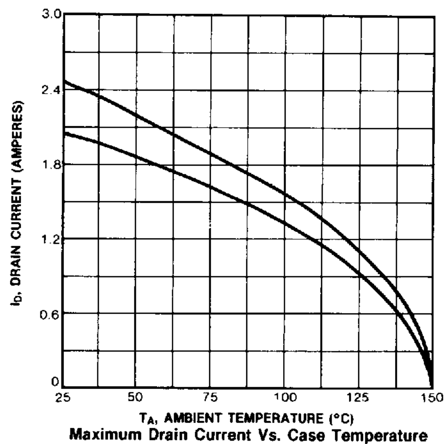
Typical Capacitance Vs. Drain to Source Voltage



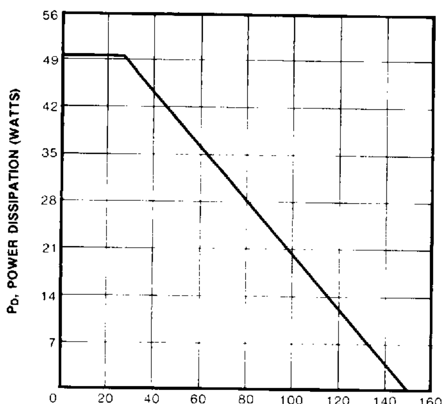
Typical Gate Charge Vs. Gate-To-Source Voltage



Typical On-Resistance Vs. Drain Current



Maximum Drain Current Vs. Case Temperature



Power Vs. Temperature Derating Curve